



U.S. Department
of Transportation

**Federal Aviation
Administration**

Memorandum

Subject: **ACTION:** Review and Concurrence, Equivalent Level of
Safety Finding for Cessna New Model 680
FAA Project #TC2548WI-T

Date: January 21, 2004

From: Manager, Airframe & Cabin Safety Branch, ANM-115

Reg Ref: § 25.807(i)

Reply to
Attn. of: T.N. Baktha, ACE-
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To: Manager, Wichita Aircraft Certification Office, ACE-
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ELOS
Memo #: TC2548WI-T-AG-1

Background

Ditching emergency exits must be provided in accordance with § 25.807(i), whether or not certification with ditching provisions is requested. Cessna has not requested approval for ditching for the Model 680, which is a 13 passenger + 2 crew, pressurized, low-wing monoplane powered with two pylon mounted Pratt & Whitney PW306C engines. The Model 680 will have emergency exits, one on each side of the aircraft. The emergency exit on the right hand side of the Model 680 airplane is an over wing exit which is in full compliance with § 25.807(i). However, the left hand emergency exit, the cabin entry door, is a Type I side exit where expected flotation in fresh water would have the lower sill below the waterline. As in Type Certificate Nos. A9NM, T00007WI and A23CE, a water barrier is provided for insertion prior to a ditching such that a freeboard is achieved from the projected flotation waterline, which will leave an opening above the waterline that complies with the minimum dimensions of a Type III exit.

Applicable regulation(s)

§ 25.807(i)

Regulation requiring an ELOS

§ 25.807(i)

Description of compensating design features or alternative standards, which allow the granting of the ELOS (including design changes, limitations or equipment need for equivalency)

Compensating factors, which Cessna believes provide an equivalent level of safety to the requirements of § 25.807(i), as required by § 21.21(b)(1), for the Model 680, are summarized in the following paragraphs. Rationale is presented to address the egress capabilities of the over wing emergency exit on the right hand side of the fuselage and the compensating factors that Cessna believes provide an equivalent level of safety to the requirements of §§ 25.801(i)(1) and (i)(2) through the use of a water barrier installed at the main cabin entry door.

The Model 680 aircraft is configured with two exit routes and openings, which are available in case of passenger and crew evacuation in water. The primary escape route is the Type III over wing emergency escape hatch on the right side of the aircraft. The emergency hatch on the right side of the aircraft can be removed, with the buoyancy waterline being below the lower edge of the

hatch opening. The buoyancy waterline derivation used in establishing the water float line is determined based on a maximum gross weight airplane at the critical float depth in fresh water. These conditions represent the worst possible flotation condition. This Type III exit is readily accessible and located in an area, which will provide room for assistance from crewmembers or other passengers. The secondary escape route is the main cabin entry door, which may be used for evacuation by installing a water barrier prior to opening the exit. This is a similar configuration to that previously certified through equivalent level of safety findings on the Citation III, VI, VII, XL, and X aircraft. A pre-flight check to confirm that the water barrier is aboard the aircraft and stowed in its designated location on the aft wall of the aft vanity closet is required. Actual installation of the barrier panel across the door opening is required prior to a planned ditching and subsequent opening of the main cabin entry door. For an unplanned ditching, the FAA requires a demonstration showing that the barrier could be retrieved, installed and occupants evacuated in the analyzed flotation time. Ease of installation of the barrier is a specific design objective such that no special training or experience is required. Installation would normally be a crew function but design simplicity would allow any occupant to complete the installation. Complete installation instructions will be contained on passenger briefing cards and placarded on the water barrier.

Figure A shows a cross-section of the fuselage at the cabin entry door and illustrates the relationship between the entry door hinge line, the estimated worst case waterline, and the entry door operating mechanism. The water pressure due to head and the force necessary to push the entry door open against the water pressure has been estimated to be less than ten pounds at the top of the door; a sufficiently small force that is well within normal passenger capabilities. The water barrier shall consist of a panel that is designed to extend across the door opening and be retained by quick attach fittings. The panel is designed to react water pressure and act as a sill in the event that evacuees elect to step on rather than over the barrier panel.

Figure B presents a cross-section of the fuselage with the entry door open and the barrier panel installed with the aircraft in the most adverse float attitude. The barrier panel is estimated to provide approximately 10.0 inches of freeboard from the most critical float depth while only requiring a maximum step-up height from the drop aisle of approximately 16.0 inches. With the cabin entry door open and the water barrier installed, the clear opening on the left side of the aircraft will be at least 26 inches wide by approximately 40.0 inches high, well in excess of the required Type III exit dimensions.

FIGURE A
CABIN DOOR CROSS SECTION - DITCHING - DOOR CLOSED

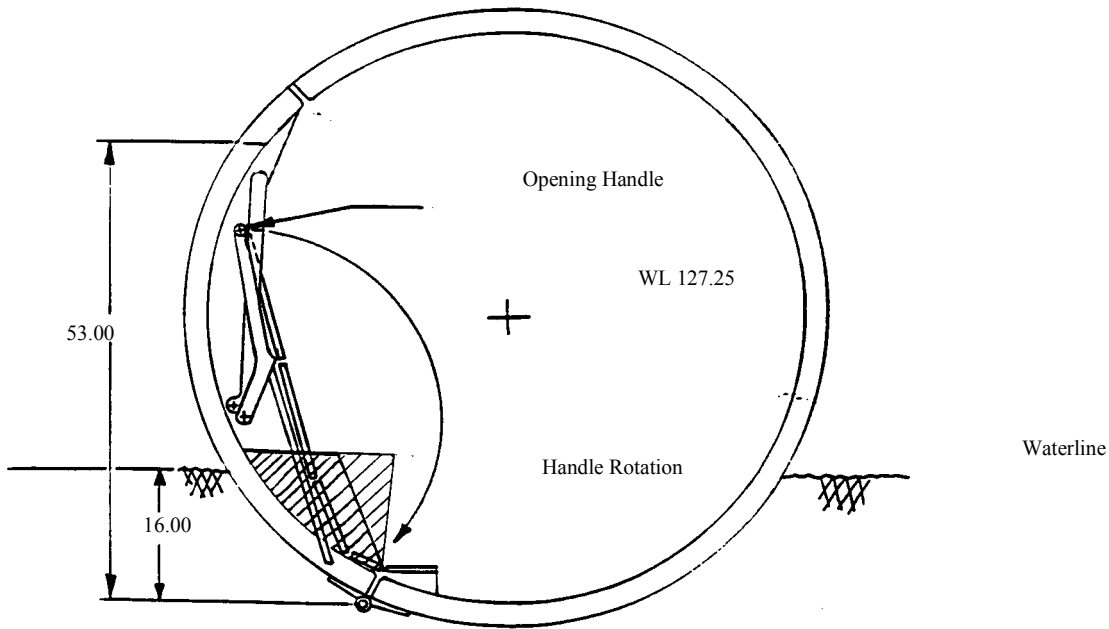
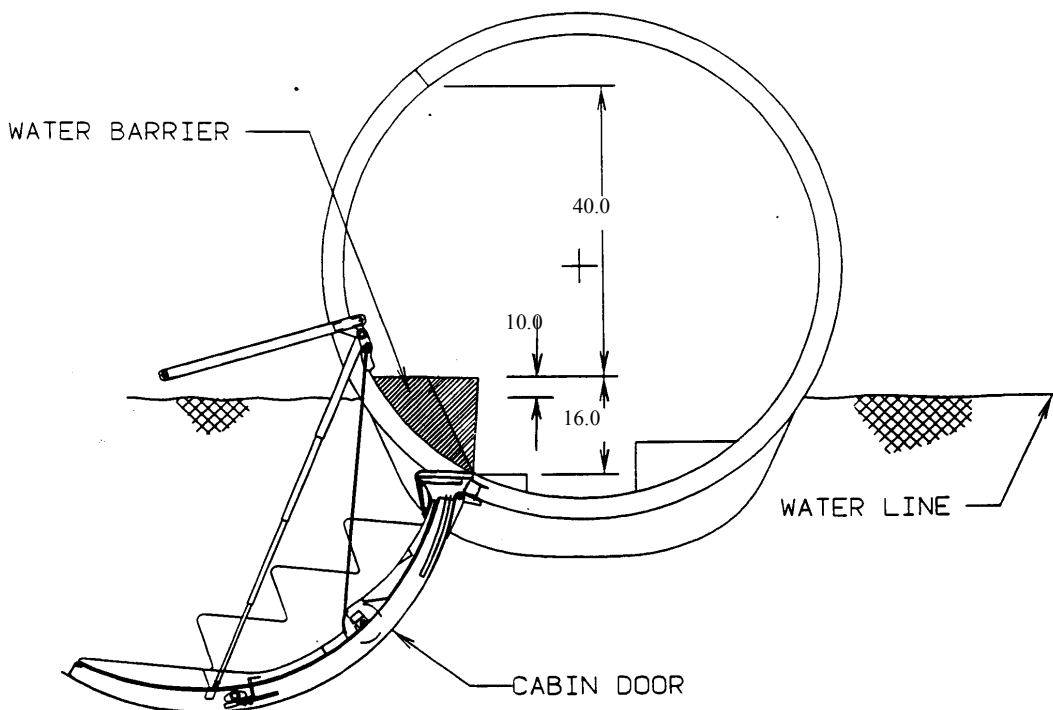


FIGURE B
CABIN DOOR CROSS SECTION - DITCHING - DOOR OPEN



The use of the water barrier described in the previous paragraphs will permit the use of the main cabin entry door as a ditching emergency exit on the left side of the aircraft. The over wing emergency escape hatch serves as the required exit on the right side of the aircraft and is unaffected by the use of the water

barrier. Therefore, the use of the water barrier at the main cabin entry door provides a configuration which complies with the ditching emergency exit requirements of §§ 25.807(i)(1) and (i)(2) by providing one Type III emergency exit on each side of the aircraft.

Explanation of how design features or alternative standards provide an equivalent level of safety intended by the regulation

Cessna requested the left main entry door design be qualified as a ditching exit by an equivalent level of safety, i.e., by the installation of a water barrier (dam). Cessna agrees to a demonstration that the barrier can, in the airplane's analyzed flotation time after a water landing, be removed from its stowed position in the aft vanity closet, be installed at the main entry door and be traversed by naive occupants with ease and rapidity.

Cessna also agrees to include FAA-approved placarding located on or immediately adjacent to the main cabin door indicating:

- 1) A water barrier is required to be installed prior to opening the door and subsequent to a ditching;
- 2) The stowed location of the water barrier.

Cessna agrees to placard the installation instructions on the water barrier itself. This equivalent safety finding, which is based on the installation of a dam and the associated placarding, covers Cessna's maximum thirteen-passenger configuration. Note is made that passenger seating configurations in this regard is as determined with reference to the Maximum Passengers allowed on the Type Certificate Data Sheet, and not by any customer configuration featuring fewer passengers.

FAA approval and documentation of the ELOS

The FAA has approved the aforementioned Equivalent Level of Safety Finding in Issue Paper AG-1. Cessna has successfully demonstrated by evacuation tests that in the Model 680 with 13 passengers and 2 crew configuration, evacuation can be accomplished by installing the water barrier within the airplane's analytically determined flotation time following a water landing. During the tests, the water barrier was removed from its stowed position in the aft vanity closet, traversed by naive occupants with ease and rapidity, and installed at the main entry door. This test complies with FAA's requirement as called for in the issue paper AG-1. FAA engineers witnessed this test. This memorandum provides standardized documentation of the ELOS that is non-proprietary and can be made available to the public. The Transport Directorate has assigned a unique ELOS Memorandum number (see front page) to facilitate archiving and retrieval of this ELOS. This ELOS Memorandum Number should be listed in the Type Certificate Data Sheet under the Certification Basis section. [E.g., Equivalent Safety Findings have been made for the following regulation: § 25.807(i) Ditching Emergency Exits for Passengers (documented in TAD ELOS Memo TC2548WI-T-AG-1)]

/s/

Signature: Franklin Tiangsing

Date: January 21, 2004

Manager, Airframe & Cabin Safety Branch, ANM-115

ELOS Originated by Wichita ACO:	Program Manager, Tina Miller	Routing Symbol ACE-117W
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